COTTAGE POLLUTION CONTROL PROGRAM

District Municipality of Muskoka

Honey Harbour
Milford Bay
Woodroffe Bay

Provisional County of Haliburton

Paudash Lake

1977

Ontario
Ministry of the Environment

COTTAGE POLLUTION CONTROL PROGRAM

1977

DISTRICT MUNICIPALITY OF MUSKOKA

Honey Harbour - Township of Georgian Bay
Milford Bay - Township of Muskoka Lakes
Woodroffe Bay - Township of Muskoka Lakes

PROVISIONAL COUNTY OF HALIBURTON

Paudash Lake - Township of Cardiff

REPORT PREPARED BY STAFF
OF THE MUNICIPAL & PRIVATE ABATEMENT SECTION
MUSKOKA-HALIBURTON DISTRICT OFFICE
GRAVENHURST

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PREFACE

Ontario's thousands of beautiful inland lakes provide an abundant resource for recreational enjoyment. To protect the quality of these waters, a delicate environmental balance must be maintained.

A heavy influx of people may subject a lake and its surrounding environment to great stress. Uncontrolled development and imprudent use of our recreational lakes may cause their deterioration and destroy their natural qualities.

The Ontario Ministry of the Environment is attempting to bring some of these stress factors under control by a variety of programs; one of these, the Cottage Pollution Control Program was initiated in 1970 to study the cottage waste disposal problem, to evaluate existing waste disposal systems and to enforce repairs to those found to be unsatisfactory.

The Ministry is carrying on research to improve the knowledge of private sewage systems and the movement of sewage effluent in shallow soils.

SUMMARY

The Cottage Pollution Control Program was established to detect and have corrected faulty private sewage disposal systems of cottages located on recreational lakes. The objective of the program is to investigate and, in conjunction with the owner, to undertake abatement work on those systems found to be faulty.

In 1977, 1,534 private sewage disposal systems were inspected in Milford Bay (Lake Muskoka), Honey Harbour (Georgian Bay) and Woodroffe Bay (Lake Joseph) in Muskoka, and Upper Paudash Lake in Haliburton. The inspection of these systems indicated that 12% were performing satisfactorily, 42% were seriously substandard, 35% were discharging wash water or solid waste onto the ground surface, 4% were direct polluters and 7% were unclassified after the initial detection survey. See Appendix I for the summary of inspection results.

As of December 31st, 1977, 237 agreements for corrective work to be carried out had been signed by the owners. Corrections have been completed and inspected for 274 systems and 637 letters have been sent to owners advising them that their systems are undersized and should be upgraded in the near future.

Contacts with owners are continuing during the winter to arrange for corrective action to be carried out in the spring of 1978.

COTTAGE POLLUTION CONTROL SURVEY

PREPARATION

During the winter of 1976, a reconnaissance and mapping program was undertaken by snowmobile on the lakes.

The snowmobile crews counted the number of establishments on the lake, photographed and described every one hundredth establishment on the shoreline, plotted the cottages on maps and located non cottage properties such as marinas, camp grounds and lodges.

Data obtained from the snowmobile work, as well as that from Cottager Associations and other agencies, was used to prepare a work schedule for the student crews in the summer.

The co-operation of Cottager Associations contributed greatly to the success of the program. Prior to the commencement of the survey of each lake, a meeting was held with each Association during which members were given a brief outline of the survey procedures to be followed and also the information that would be required from each cottager. In certain cases, a mid-summer meeting was arranged with the Association during which abatement procedures were discussed.

Detection Surveys

The crews, each composed of two students, began the survey of the lake by preparing a description log in which each establishment was systematically numbered and accurately described to facilitate the location of the premises by other staff.

Each establishment was then inspected to determine the type, size, location and design of sewage disposal systems; the soil type and depth in the area of all tile beds; the source of drinking water; and other related factors.

A preliminary performance classification of all waste disposal systems was made by the students prior to referring the file to their supervisor for final classification.

Classification of Sewage Disposal Systems

The sewage disposal systems of all premises surveyed were classified into one of the following groups.

1. Satisfactory - the system meets all current standards of good design, construction and location, and is properly maintained.

2. Satisfactory (Acceptable) Performance - the system may not quite meet current standards of design and construction but is properly located with respect to distance from lake, well etc., and is maintained in good condition.

3. Seriously Substandard - a system which does not meet current standards of design, construction and location and/or is in a state of neglect. Although this system is not deemed to be causing pollution at the time of inspection, a potential hazard exists. The owner is notified of the deficiency and is advised that consideration should be given to updating the system in the near future.

4. Nuisance (Wash Water) - a system causing wash water to be exposed on the surface of the ground either directly through a waste pipe, escaping from a seepage pit or just thrown on the ground surface. Such a condition is known as a Public Health Nuisance. Wash water discharged from any sanitary fixture is contaminated and creates an unhealthy environment. Phosphates and other nutrients from waste water discharges encourage weed growth and affect the aesthetic quality of the lake.

5. Nuisance (Toilet and Solid Waste) - a system causing faecal or urinary discharges to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of a sewage disposal system including a privy. Also included in this classification is "solid waste" or garbage of a kind which can cause a "nuisance"; for example, domestic garbage containing food waste.

6. Direct Polluter - a system which is permitting sewage to contaminate the ground water or to reach the lake either by direct discharge through a pipe or ditch or over the ground surface.

Classification of Sewage Disposal Systems (Cont'd)

7. Unclassified (temporarily) - a system which has been given a preliminary classification by the student inspector where he feels he cannot use any of the preceeding classifications and has doubts about the system, or any part of it. These systems require further inspection by the supervisor who will attempt to make a final classification after a thorough investigation.

8. Unclassified - a system (or systems) where it is not possible by the end of the survey to make a classification. This category includes only a few abandoned premises in a dilapidated condition with a system that is obviously not in use and could not be used.

WATER SAMPLING

The Public Health Laboratories provided the necessary water sample analyses to detect total and faecal coliforms in the lake water samples.

Drinking water samples were obtained when the cottager was using an unchlorinated water supply. These samples were analysed at the Public Health Laboratory. Any owner having a drinking water sample which revealed an unsatisfactory total or faecal coliform indication was immediately informed to this effect; instructions were also sent regarding procedures for disinfecting the drinking water supply.

All lake water samples fell well within the criteria for total body contact recreational use of 1,000 total coliforms per 100 ml, and 100 faecal coliforms per 100 ml, as outlined in the Ministry of the Environment booklet "Guidelines and Criteria for Water Quality Management, July, 1974."

CORRECTIVE PROCEDURE

After the file is examined by the supervisor and the original classification is confirmed or altered, it is referred to the Environmental Officer. The Officer then interviews the establishment owner to advise him of the findings and discuss corrective action. If the owner agrees with the findings, a corrective program is initiated. He is asked to sign an "abatement agreement form" stating the corrections to be completed by a specific date. A final inspection is carried out upon completion of the corrective work and the sewage disposal system file is appropriately reclassified. Occasionally an owner refuses to comply with a correction program and legal action must be initiated to ensure the problem is abated.

In the case of commercial establishments, this procedure is often more complicated requiring an engineering study and the submission of plans and soil analysis reports for approval. Except where he is a direct polluter, the owner is contacted and is instructed to submit plans for corrective measures to be completed prior to the opening of the next commercial season. A direct polluter must take corrective action immediately to prevent pollution of the lake.

METHODS OF SEWAGE DISPOSAL

Much of the shoreline property in Muskoka and Haliburton has minimal soil over bedrock; therefore, it is unsuitable, in a natural state, for subsurface sewage disposal. This can be remedied in some areas by placing suitable filter material over an area capable of supporting a subsurface sewage disposal system.

Methods of Sewage Disposal (Cont'd)

The use of a holding tank may provide a more economical solution for the disposal of sewage and may be recommended if a contract for the pump-out of the tank can be secured. (It is to be noted that disposal sites for holding tank pump-out are rapidly nearing capacity. This may result in restricting the use of holding tanks.)

On some lots where there is restricted space for a conventional sewage disposal system, the installation of a proprietary aerobic sewage treatment system may provide a viable alternative.

Recently there have been many developments in sewage disposal systems and the Ministry of the Environment is continually monitoring new systems which are marketed in Ontario.

The Ministry of the Environment or other designated authority should be consulted and approval obtained before any sewage disposal system is installed.

ABATEMENT PROGRESS FROM 1976 COTTAGE POLLUTION CONTROL PROGRAM

During the summer of 1976 the Cottage Pollution Control Program was conducted on the following lakes: Dickie, Go Home Bay, Loon, Muldrew, Ril and Turtle Lake in the District Municipality of Muskoka, and Lake St. John in Simcoe County. A total of 1,140 private sewage disposal systems were inspected. Of these, 25% were performing satisfactorily, 26% were found to be seriously substandard, 39% were discharging wash water or solid waste onto the ground surface, 3% were direct polluters and 7% were unclassified after the initial detection survey. All of the owners

with seriously substandard systems were contacted and advised that their system should be watched carefully and may require updating in the near future. As of January 1st, 1978, corrective action on 65% of the systems which required upgrading was completed. The owners of the majority of the remaining systems requiring upgrading have signed agreements for completion during the summer of 1978.

Legal action will be initiated against the few remaining owners who have refused to respond to several attempts by Environmental Officers to have corrective action carried out.

1977 COTTAGE POLLUTION CONTROL PROGRAM

HONEY HARBOUR

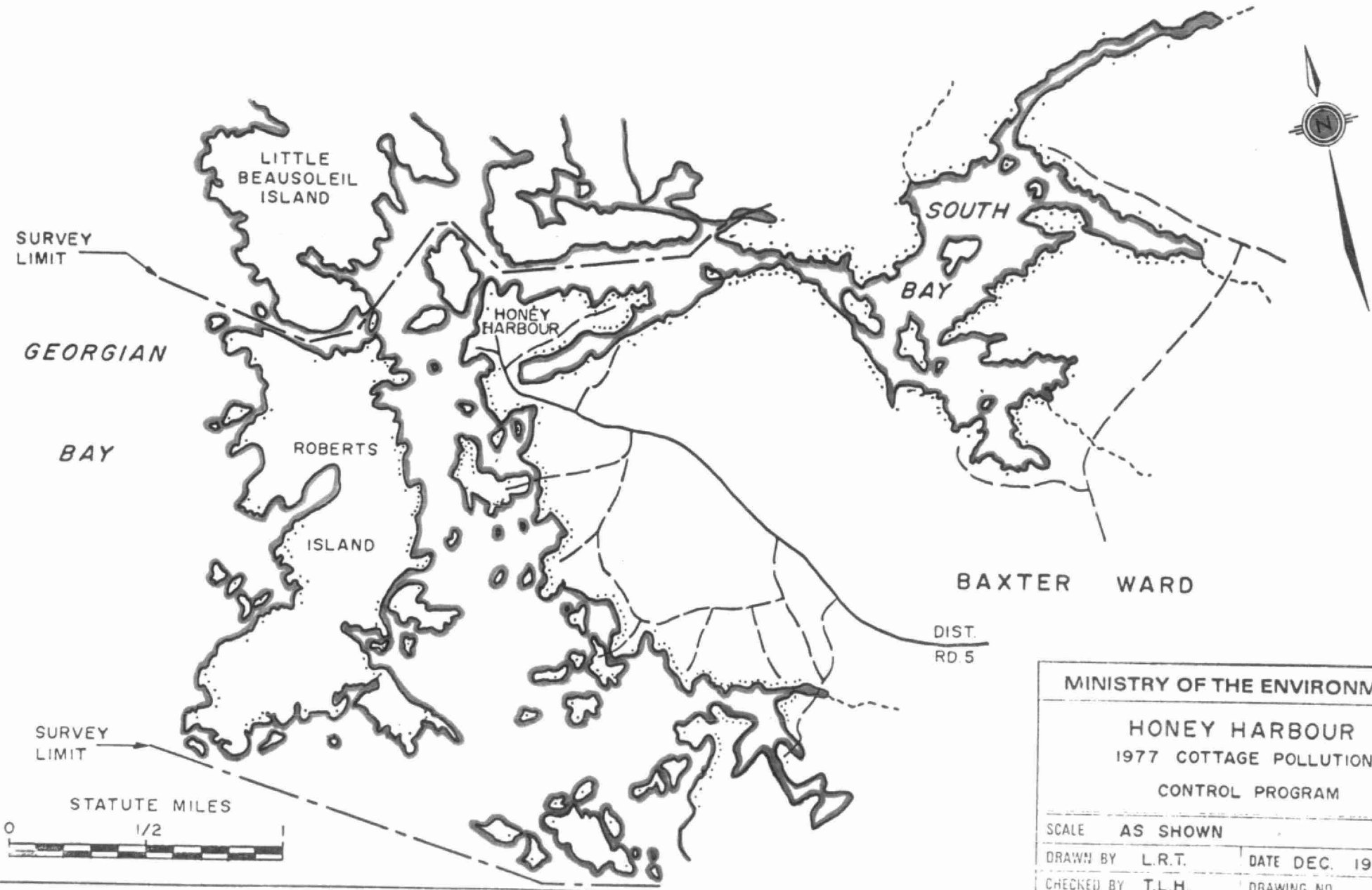
Honey Harbour is located on Georgian Bay, just north of the mouth of the Severn River. It is in Baxter Ward of the Township of Georgian Bay.

Honey Harbour lies on the Precambrian Shield at an elevation of 176 metres (576 feet) above sea level. The surrounding topography was subjected to glacial scouring which left exposed rock or shallow till soils. The windswept shoreline results in shallow silty soils occasionally combined with sand or clay with numerous rock outcroppings.

The general limits of the survey were Tobies Bay as the southerly boundary and South Bay as the northerly boundary. Roberts Island was included together with many other small islands between Roberts Island and the mainland.

Within these limits, 834 private sewage disposal systems were inspected during the summer of 1977. Of these systems, 331 or 40% were classified as seriously substandard, 356 or 43% were unsatisfactory due to improper disposal of solid waste or wash water, and 36 or 4% were classified as direct polluters. (See Appendix I for further classification information).

As of December 31st, 1977, 117 faulty systems have been corrected, and 182 owners have signed agreements to have work completed during the construction season of 1978. The remainder were notified by letter of their problems and Ministry Environmental Officers are currently directing their efforts toward obtaining commitments from these owners.



MINISTRY OF THE ENVIRONMENT

HONEY HARBOUR
1977 COTTAGE POLLUTION CONTROL PROGRAM

SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1977
CHECKED BY T.L.H.	DRAWING NO.

MILFORD BAY

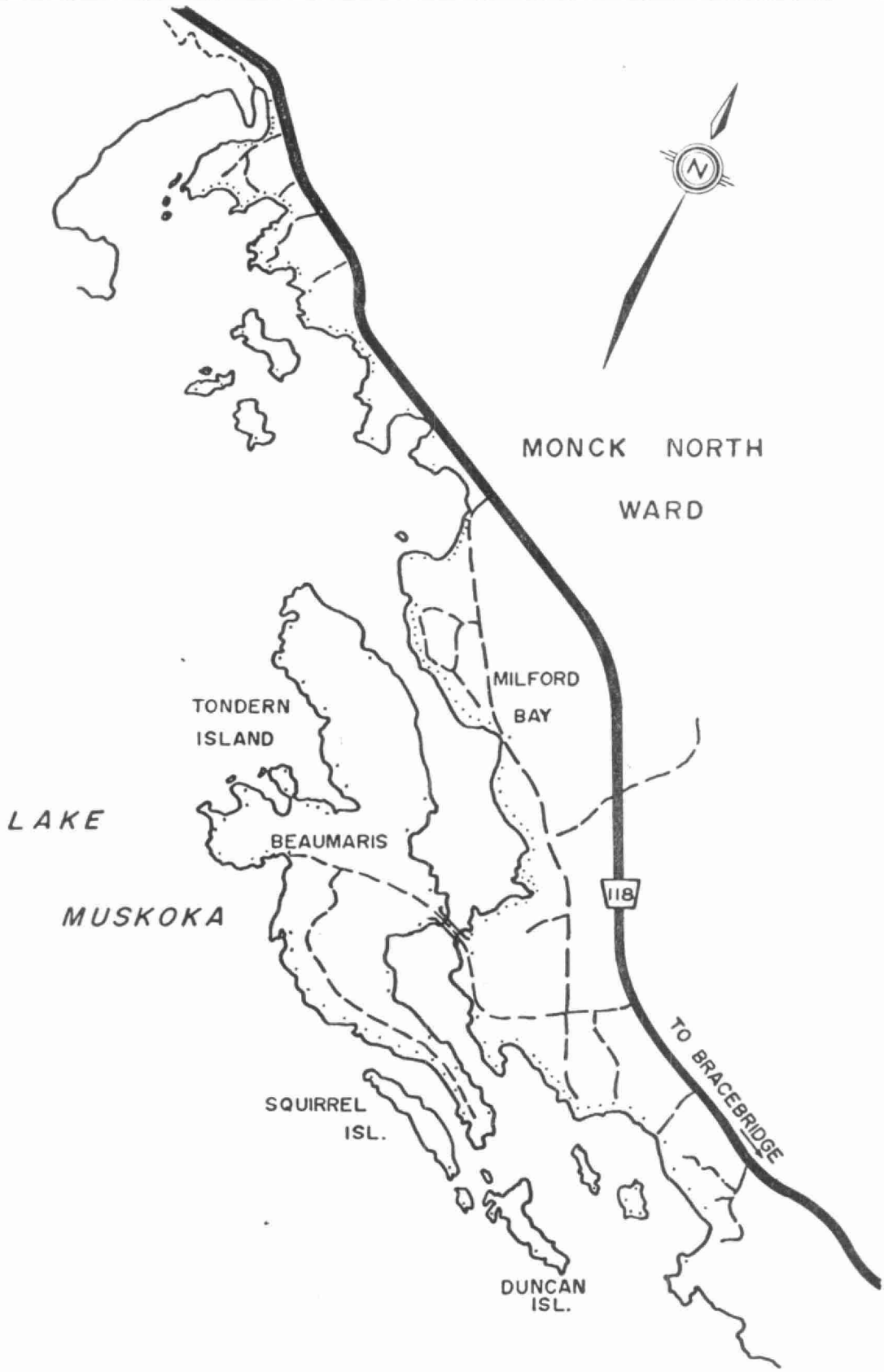
Milford Bay is located on Lake Muskoka, in Monck North Ward of the Township of Muskoka Lakes. It is situated approximately 18 kilometres (11 miles) west of the Town of Bracebridge.

The topography consists mainly of Precambrian Shield rock ridges with shallow clayey till soils. The shoreline is rugged and scattered with a mixture of coniferous and deciduous trees.

The limits of the survey were from Brandy River as the northerly boundary, to a point of land east of Duncan Island as the southerly boundary. Also included were Tondern, Squirrel and Duncan Islands, together with many small islands in the vicinity.

Within these limits, 292 private sewage disposal systems were inspected during the summer of 1977. Of these, 127 or 43% were classified as seriously substandard, 65 or 22% were unsatisfactory due to improper disposal of solid waste or wash water, and 18 or 6% were classified as direct polluters. (See Appendix I for classification information).

To date, all the owners with problems have been notified by letter or have had personal contact with this office. As of December 31st, 1977, 55 faulty systems have been corrected and 30 owners have signed agreements to have work completed during the construction season of 1978. Ministry Environmental Officers are currently working on obtaining agreements with the remaining individuals.



STATUTE MILES

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MINISTRY OF THE ENVIRONMENT

MILFORD BAY AREA OF LAKE MUSKOKA

1977 COTTAGE POLLUTION CONTROL PROGRAM

SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1977
CHECKED BY T.L.H.	DRAWING NO.

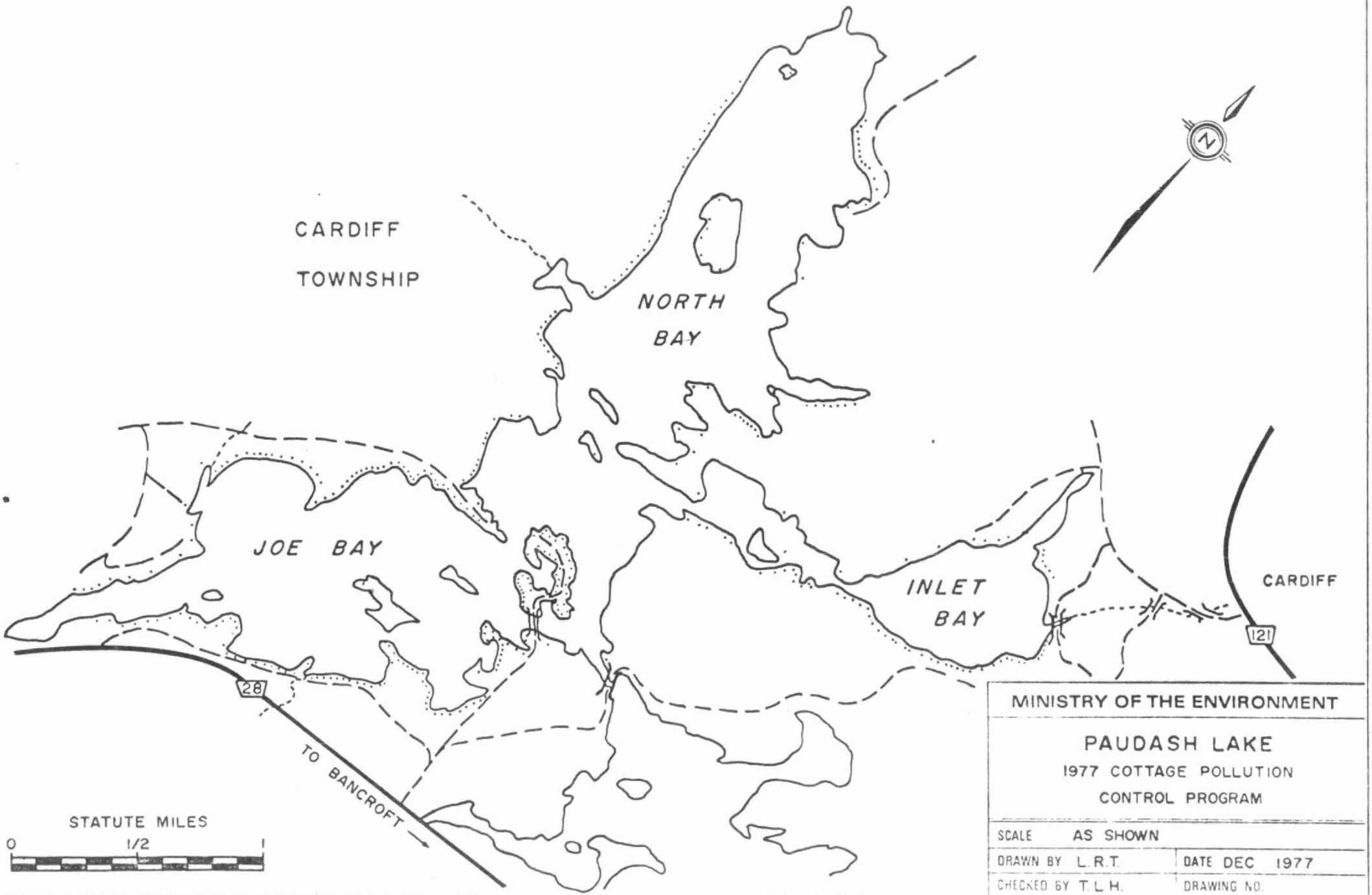
PAUDASH LAKE

Paudash Lake is located in the Township of Cardiff in the Provisional County of Haliburton. This lake is 18 kilometres (11 miles) south of the Village of Bancroft.

The lake is physically divided into three bays; Joe Bay, North Bay and Inlet Bay. Joe and North Bays are characterized by rolling hills of bedrock covered with a shallow overburden of sandy soils, while Inlet Bay shows signs of a glacial spillway with sandy soils.

There were 364 private sewage disposal systems inspected on Paudash Lake during the summer of 1977. Of these, 160 or 44% were classified as seriously substandard, 116 or 32% were unsatisfactory due to improper disposal of solid waste or wash water and 3 or 1% were classified as direct polluters. (See Appendix I for classification information).

As of December 31st, 1977, 97 faulty systems have been corrected, and 23 owners have signed agreements to have work completed during the construction season of 1978. The remainder were notified by letter of their problems and Ministry Environmental Officers are currently directing their efforts toward obtaining commitments from these owners.



MINISTRY OF THE ENVIRONMENT

PAUDASH LAKE

1977 COTTAGE POLLUTION CONTROL PROGRAM

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DRAWN BY L.R.T.	DATE DEC 1977
CHECKED BY T.L.H.	DRAWING NO.

TRANSLAR 250-9-75

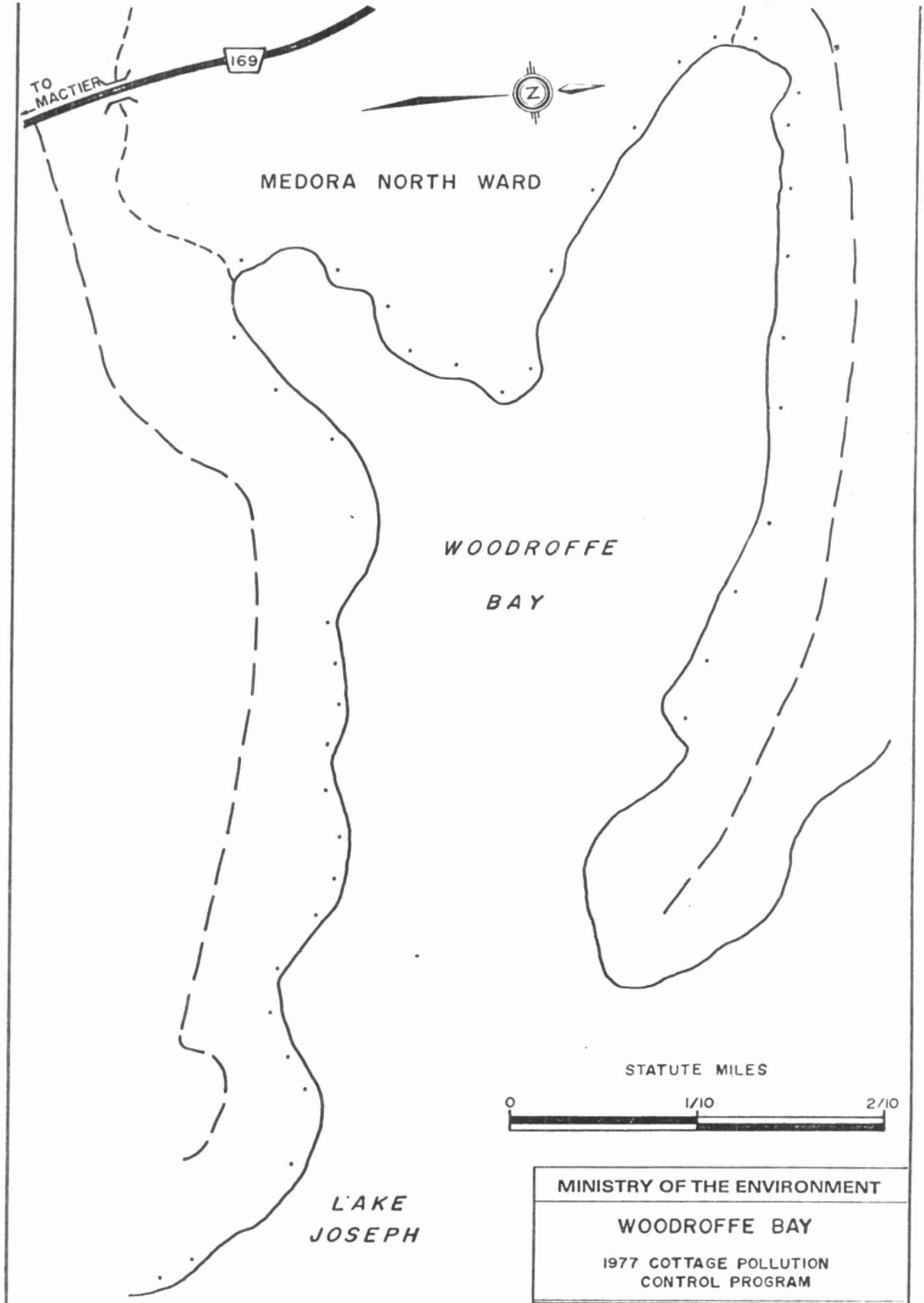
WOODROFFE BAY

Woodroffe Bay is located on Lake Joseph in Medora Ward of the Township of Muskoka Lakes. This inlet is situated on Highway 69 approximately 8 kilometres (5 miles) north of the community of MacTier.

The shoreline of Woodroffe Bay generally consists of protruding Precambrian rock with shallow soil pockets. The soil cover is mainly composed of an organic silt mixture.

There were 44 sewage disposal systems inspected on Woodroffe Bay during early September of 1977. Of these systems, 19 or 43% were classified as seriously substandard, 3 or 7% were unsatisfactory due to improper disposal of solid waste or wash water, and 2 or 4% were classified as direct polluters. (See Appendix I for classification information).

To date, all the owners with problems have been notified by letter or have had personal contact with this office. As of December 31st, 1977, 5 faulty systems have been corrected and 2 owners have signed agreements to have work completed during the construction season of 1978. Ministry Environmental Officers are currently working on obtaining agreements with the remaining individuals.



MINISTRY OF THE ENVIRONMENT

WOODROFFE BAY

1977 COTTAGE POLLUTION CONTROL PROGRAM

SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1977
CHECKED BY T.L.H.	DRAWING NO.

APPENDIX I

PRELIMINARY CLASSIFICATION OF SYSTEMS INSPECTED

1977

BODY OF WATER	NUMBER OF SYSTEMS INSPECTED	CLASSIFICATION OF SYSTEMS *															
		SATISFACTORY		SATISFACTORY PERFORMANCE		SERIOUSLY SUBSTANDARD		NUISANCE (WASH WATER)		NUISANCE (SOLID WASTE)		DIRECT POLLUTER		UNCLASSIFIED TEMPORARILY		UNCLASSIFIED	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Honey Harbour	834	18	2.2	46	5.5	331	39.7	182	21.8	174	20.8	36	4.3	43	5.2	4	0.5
Milford Bay	292	4	1.4	47	16.1	127	43.5	20	6.8	45	15.4	18	6.2	30	10.3	1	0.3
Paudash Lake	364	11	3.0	50	13.7	160	44.0	46	12.6	70	19.2	3	0.8	22	6.1	2	0.6
Woodroffe Bay	44	1	2.3	16	36.4	19	43.2	2	4.5	1	2.3	2	4.5	3	6.8	0	0.0
Totals	1,534	34	2.2	159	10.4	637	41.5	250	16.3	290	18.9	59	3.8	98	6.4	7	0.5

* See page 4 for definition of classifications

LAKES SURVEYED - MUSKOKA-HALIBURTON

YEAR OF SURVEY	LAKE	NUMBER OF SYSTEMS INSPECTED
1967	Six Mile (Crooked Bay)	165
1969	Riley	150
1970	Sparrow	302
1972	Muskoka (Muskoka Bay)	270 ~~39~~
1971	Leonard	112
1974	Bass (Ryde)	23
1974	Clear (Wood)	155
1974	Harp	78
1974	Kahshe	481
1974	Twelve Mile Bay	168
1974	Wood	205
1975	Muskoka (Bala Bay)	280
1975	Dark	38
1975	Gull	138
1975	Gull (Haliburton)	413
1975	Silver	37
1975	Three Mile	542
1976	Joseph (Ames Point)	25
1976	Muskoka (Sandy Bay)	17
1976	Dickie	121
1976	Go Home Bay	119
1976	Loon	175
1976	Muldrew	378
1976	Ril	140
1976	Turtle	63
1977	Honey Harbour	834
1977	Milford Bay	292
1977	Paudash (Haliburton)	364
1977	Joseph (Woodroffe Bay)	44

* The Cottage Pollution Control Program has been conducted by the Gravenhurst Ministry of the Environment office since 1974. Lakes surveyed prior to 1974 in the Muskoka area were controlled by the Ontario Department of Health.

ABOUT COTTAGE POLLUTION CONTROL

This material is designed to provide pollution control information to cottage owners in Ontario's recreational lakes districts. Of interest to cottagers is data on nutrient enrichment of lakes, septic tanks, water treatment, proper boat maintenance and mosquito and black fly control.

EUTROPHICATION OR EXCESSIVE FERTILIZATION AND LAKE PROCESSES

In recent years, cottagers have become aware of the problems associated with nutrient enrichment of recreational lakes and have learned to recognize many of the symptoms characterizing nutrient enriched (eutrophic) lakes. It is important to realize that small to moderate amounts of aquatic plants and algae are necessary to maintain a balanced aquatic environment. They provide food and suitable environment for the growth of aquatic invertebrate organisms which serve as food for fish. Shade from large aquatic plants helps to keep the lower water cool, which is essential to certain species of fish and also provides protection for young game and forage fish. Numerous aquatic plants are utilized for food and/or protection by many species of waterfowl. However, too much growth creates an imbalance in the natural plant and animal community particularly with respect to oxygen conditions, and some desirable forms of life such as sport fish are eliminated and unsightly algae scums can form. The lake will not be "dead" but rather abound with life which, unfortunately, is not considered aesthetically pleasing. This change to poor water quality becomes apparent after a period of years during which extra nutrients are added to the lake and return to the natural state may also take a number of years after the nutrient inputs are stopped.

Changes in water quality with depth are a very important characteristic of the lake. Water temperatures are uniform throughout the lake in the early spring and winds generally keep the entire volume well mixed. Shallow lakes may remain well mixed all summer so that water quality will be the same throughout. On the other hand, in deep lakes, the surface waters warm up during late spring and early summer and float on the cooler more dense water below. The difference in density offers a resistance to mixing by wind action and many lakes do not become fully mixed again until the surface waters cool down in the fall. The bottom water receives no oxygen from the atmosphere during this unmixed period and the dissolved oxygen supply may be all used up by bacteria as they decompose organic matter. Cold water fish, such as trout, will have to move to the warm surface waters to get oxygen and because of the high water temperatures they will not thrive, so that the species will probably die out (see Figure next page).

Low oxygen conditions in the bottom waters are not necessarily an indication of pollution but excessive aquatic plant and algae growth and subsequent decomposition in the bottom waters can aggravate the condition and in some cases result in zero oxygen levels in lakes which had previously held some oxygen in the bottom waters all summer. Although plant nutrients normally accumulate in the bottom waters of the lakes, they do so to a much greater extent if there is no oxygen present. These nutrients become available for algae in the surface waters when the lake mixes in the fall and dense algae growths can result.

Consequently, lakes which have no oxygen in the bottom water during the summer are more prone to having algae problems and are more vulnerable to nutrient inputs than lakes which retain some oxygen.

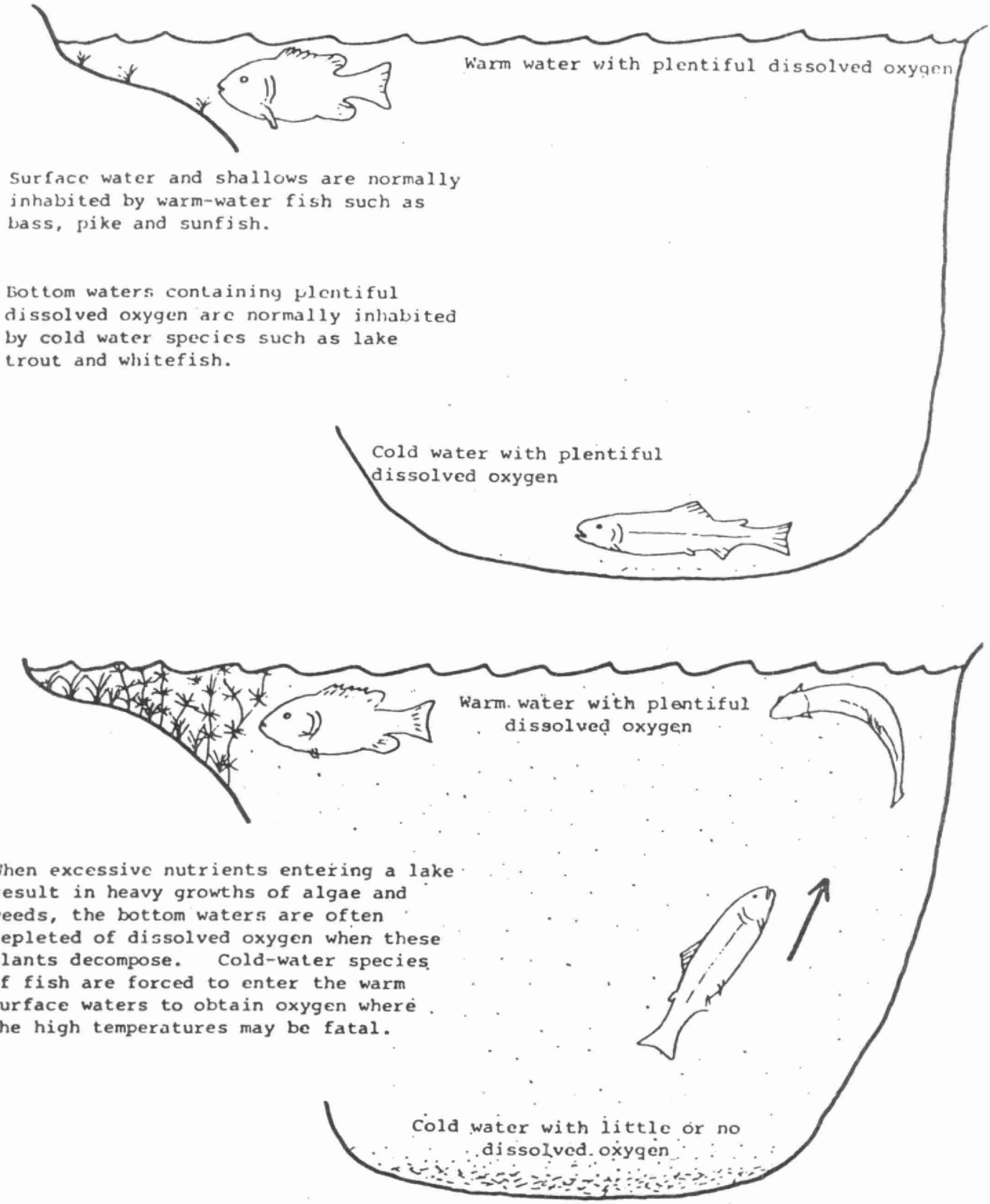


FIGURE A- DECOMPOSITION OF PLANT MATTER AT THE LAKE BOTTOM CAN LEAD TO DEATH OF DEEP-WATER FISH SPECIES.

Like humans, aquatic plants and algae require a balanced "diet" for growth. Other special requirements including those for light and temperature are specific for certain algae and plants. Chemical elements such as nitrogen, phosphorous, carbon, and several others are required and must be in forms which are available for uptake by plants and algae. Growth of algae can be limited by a scarcity of any single "critical" nutrient. Nitrogen and phosphorous are usually considered "critical" nutrients because they are most often in scarce supply in natural waters, particularly in lakes in the Precambrian area of the Province. Phosphorous, especially is necessary for the processes of photosynthesis and cell division. Nitrogen and phosphorous are generally required in the nitrate-N (or ammonia-N) and phosphate forms and are present in natural land runoff and precipitation. Human and livestock wastes are a very significant source of these and other nutrients for lakes in urban and agricultural areas. It is extremely important that cottage waste disposal systems function so that seepage of nutrients to the lake does not occur since the changes in water quality brought about by excessive inputs of nutrients to lakes are usually evidenced by excessive growths of algae and aquatic plants.

The large amounts of suspended algae which materialize from excessive inputs of nutrients, result in turbid water of poor clarity or transparency. On the other hand, lakes with only small, natural inputs of nutrients and correspondingly low nutrient concentrations (characteristically large and deep lakes) most often support very small amounts of suspended algae and consequently, are clear-water lakes. An indication of the degree of enrichment of lakes can, therefore, be gained by measuring the density of suspended algae (as indicated by the chlorophyll a concentration -- the green pigment in most plants and algae) and water clarity (measured with a Secchi disc). In this regard, staff of the Ministry of the Environment

have been collecting chlorophyll a and water clarity data from several lakes in Ontario and have developed a graphical relationship between these parameters which is being used by cottagers to further their understanding of the processes and consequences of nutrient enrichment of Precambrian lakes. The figure shown on the following page illustrates the above-mentioned relationship.

In the absence of excessive coloured matter (e.g. drainage from marshlands), lakes which are very low in nutrients are generally characterized by small amounts of suspended algae (i.e. chlorophyll a) and are clear-water lakes with high Secchi disc values. Such lakes, with chlorophyll a and Secchi disc values lying in the upper left-hand area of the graph are unenriched or nutrient poor ("oligotrophic") in status and do not suffer from the problems associated with excessive inputs of nutrients. In contrast, lakes with high chlorophyll a concentrations and poor clarity are positioned in the lower right-hand area of the graph and are enriched ("eutrophic"). These lakes usually exhibit symptoms of excessive nutrient enrichment including water turbidity owing to large amounts of suspended algae which may float to the surface and accumulate in shelthered areas around docks and bays.

Measurements of suspended algal density (chlorophyll a) and water clarity are especially valuable if carried out over several years. Year to year positional changes on the graph can then be assessed to determine whether or not changes in lake water quality are materializing so that remedial measures can be implemented before conditions become critical.

MEAN CHLOROPHYLL a AND SECCHI DISC MEASUREMENTS

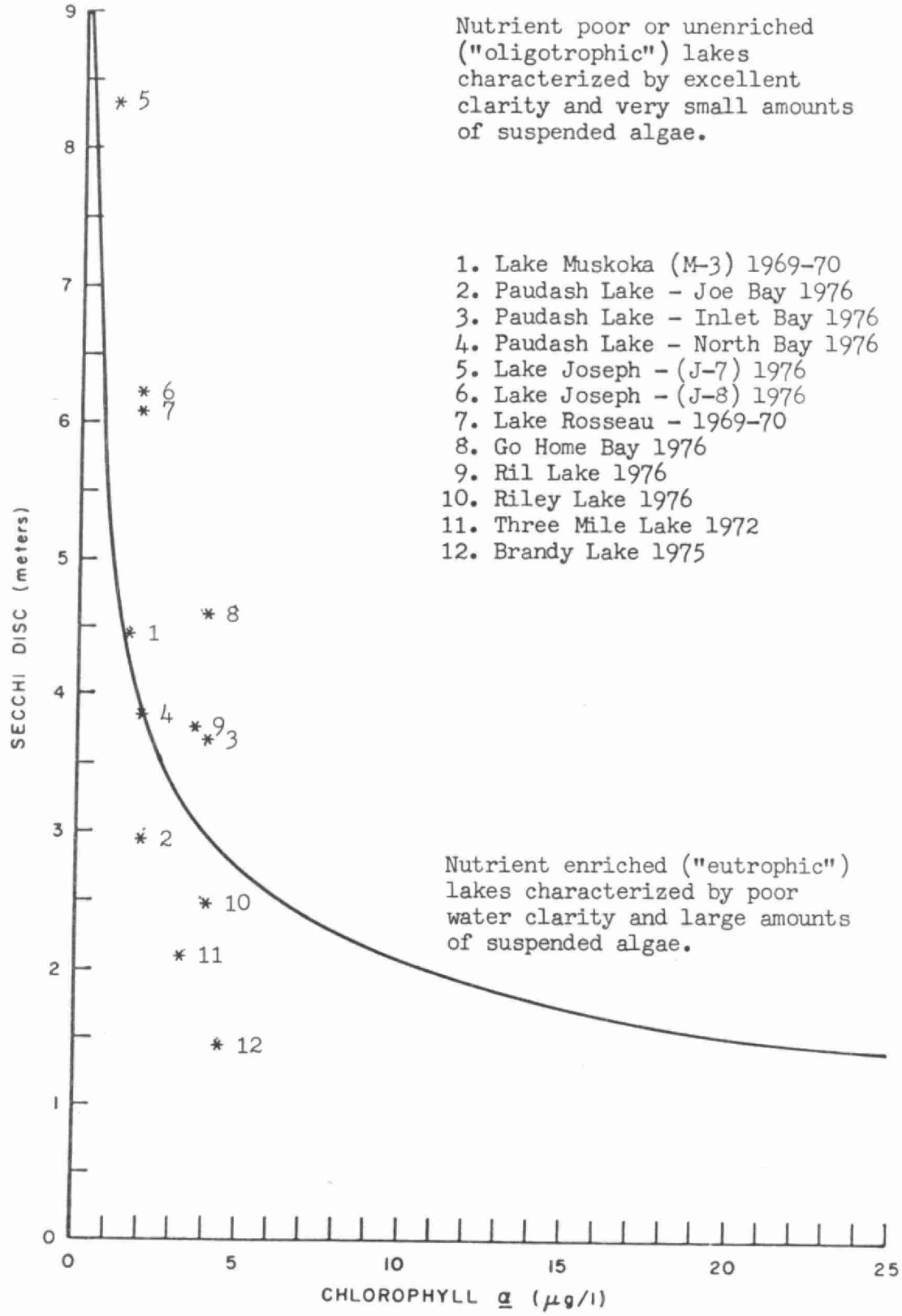


Figure B

SECCHI DISC-CHLOROPHYLL a SELF-HELP PROGRAM

The "Self Help Program" was initiated in 1971 in response to requests for water quality surveys from concerned cottagers on many recreational lakes throughout the Province. Previous experience indicated that the enrichment status of a lake can be estimated relatively easily by using Secchi disc readings and chlorophyll a concentrations (the green pigment in algae) to give an indication of water clarity and algal density respectively.

Cottage Associations are supplied with sampling kits which includes a Secchi disc, a water sampler, bottles and instructions. Participants are asked to take Secchi readings and to collect water samples bi-weekly during the ice-free period of the year. The water samples are shipped to the nearest Ministry of the Environment laboratory where they are analyzed for chlorophyll a. The true value of the program is only realized if it is continued for a number of years in order to delineate long term trends.

Mean annual Secchi disc readings and chlorophyll a concentrations in uncoloured lakes have been grouped into approximate ranges to indicate the status of enrichment.

	SECCHI DISC (S.D.) (metres - m)		CHLOROPHYLL a (Chloro-a) (micrograms per litre-ug/l)
Enriched	0-3 m	High Algal Density	4 ug/l or greater
Moderately Enriched	3-5 m	Moderate Algal Density	2-4 ug/l
Unenriched	5 m or greater	Low Algal Density	0-2 ug/l

The trophic status of the lakes, studied by the Cottage Pollution Control Program in 1977 is indicated on the previous page. Honey Harbour has not been involved in the Self-Help Program.

AQUATIC PLANT CONTROL

Many shallow lakes, such as those in the Kawartha District, provide ideal conditions for aquatic plants. These lakes are warm in summer and the profuse plant life provides an excellent habitat for sport fish species. Unfortunately, the plants pose a problem when man attempts to use the lakes for recreation. These lakes may be quite healthy, but the plants are only a "problem" when man wants to make specific use of the water.

Complete removal of the plant life is not desirable since it is important for good fishing. Some management technique is needed that will satisfy the needs of boaters, fishermen, and swimmers, but that also will maintain the lake's healthy state.

PLANT HARVESTING

Mechanical harvesting has shown to be applicable to the Kawartha situation. Ministry of the Environment experiments in Chemung Lake in 1976 covered more than 1,000 acres of the lake. The fish were there, but the fishermen could not get to them because of the heavy plant growth.

Plant harvesting is a good example of a technique which satisfies man's requirements and still protects or even improves the natural lake conditions.

SEPTIC TANK INSTALLATIONS

In Ontario, provincial law requires under Part 7 of The Environmental Protection Act that before you extend, alter, enlarge, or establish any building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to

issue the Certificate of Approval. Any other pertinent information such as size, types, and location of septic tanks and tile fields can also be obtained from the same authority.

(1) General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake, stream, pond, spring, river or reservoir
- 5 feet to any building
- 10 feet to any property boundary

The tile field should not be closer than:

- 100 feet to the nearest dug well
- 50 feet to a drilled well which has a casing to 25 feet below ground
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed
- 10 feet to any other building
- 10 feet to a property boundary
- 50 feet to any lake, stream, pond, spring, river or reservoir.

The ideal location for a tile field is well-drained, sandy loam soil remote from any wells, or other drinking water sources. For the tile field to work satisfactorily, there should be at least three feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

Recognizing that private sewage systems are relatively inefficient where shallow and inappropriate soil conditions are present (e.g. Precambrian areas) the Ministry of the Environment is conducting research into alternate methods of private sewage disposal in unsewered areas; into the improvement of existing equipment and methods of design and operation for these

systems; and into the development of better surveillance methods such as by the use of chemical, biological, and radioactive tracers to detect the movement of pollutants through the soil mantle.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest among cottage owners to dye test their sewage systems; however, several problems are associated with dye testing. Dye would be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his system and no dye was visible in the lake, he would assume that his system is satisfactory, which might not be the case. A low concentration of dye is not visible and, therefore, expensive equipment such as a fluorometer is required. Only qualified people with adequate equipment are capable of assessing a sewage system by using dye. In any case, it is likely that some of the water from a septic tank will eventually reach the lake. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region, and the shape and flow of the shifting water table are required. Therefore, we recommend that this type of study should be performed only by qualified professionals.

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups: the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease-causing micro-organisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious water borne infections such as typhoid fever, polio, or hepatitis, but he may catch less serious infections of gastroenteritis (sometimes called stomach flu), dysentery, or diarrhea. Included in these minor afflictions are eye, ear, and throat infections that swimmers encounter every year and the more insidious but seldom diagnosed, subclinical infections usually associated with several waterborne viruses. These viral infections leave a person not feeling well enough to enjoy holidaying although not bedridden. This type of microbial pollution can be remedied by preventing wastes from reaching the lake and water quality will return to satisfactory conditions within a relatively short time (approximately one year) since disease-causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise, in turn, to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lakes bacteria. Unfortunately, biodegradation of the organic wastes by organisms uses correspondingly large amounts of the dissolved oxyten. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxyten supply in the bottom waters and threaten the survival of many deep-water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of the Recreational Lakes. Heavy precipitation has been shown to flush the land area around the lake and the subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, faecal coliforms, and faecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Precambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow privides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up within 12 to 48 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals, and birds (all of which can be carriers of disease); consequently, NO SURFACE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment, including Disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

(a) Boiling

Boil the water for a minimum of five minutes to destroy the disease-causing organisms.

(b) Chlorination

Chlorination using a household bleach containing 4 to $5\frac{1}{4}$ per cent available chlorine.

Eight drops of household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

(c) Continuous Chlorination

For continuous water disinfection, a small domestic hypo-chlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

(d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at five per cent available chlorine) if the depth of water and diameter of the well are known.

BOATING AND MARINA REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats, must be retained in suitable equipment.

Equipment which is considered suitable by the Ministry of the Environment includes: (1) retention devices with or without re-circulation which retain all toilet wastes for disposal ashore, and (2) incinerating devices which reduce all sewage to ash.

Equipment for storage of toilet wastes shall:

1. be non-portable
2. be constructed of structurally-sound material
3. have adequate capacity for expected use
4. be properly installed, and
5. be equipped with the necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with 1½-inch diameter National Pipe Thread is commonly used).

An Ontario regulation requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "tips" may be of assistance to you in boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.
5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent blow-back.

6. Empty oil cans must be deposited in a leak-proof receptacle.

7. Slow down and save fuel.

BLACKFLIES AND MOSQUITOES

These are the most bothersome, biting insects in the cottage country. Mosquitoes breed in any kind of standing water whether a roadside ditch, unemptied pails of rainwater, flat roofs, or swampy areas. The simplest method for controlling mosquito larvae is making sure that all standing water in any kind of receptacle around the cottage is kept empty. The property should be laid out so that water standing in ditches is kept running, by careful drainage planning. Swimming pools should be properly filtered and chlorinated, and eavestroughs should be kept clear of leaves. Low depressed areas that might fill with water should be filled in. In the garden areas and lawns, regular mowing of weeds and grass, trimming hedges and removing unnecessary shrubbery will help remove wind and sun protection from adult mosquitoes. To minimize bites, make sure any holes in screening are repaired, and make sure the screens are tightly sealed. Restrict outdoor activities in the evenings if at all possible, and keep the damper on your fireplace closed.

Lighter coloured clothing is less attractive to a hungry mosquito and if you are working or visiting in areas where the mosquito population is heavy, make sure to wear loose protective clothing such as long sleeved shirt, light jacket, slacks, and socks. Mosquitoes are particularly bothersome at night and in dark wooded areas, during the day, so take the proper precautions and you will suffer less.

Repellents are available in both liquid or stick form. Read the instructions carefully before using and be careful not to get the material in your eyes or mouth. The types that contain a higher concentration (in percentage)

of the active ingredient will do a better job.

Blackflies are particularly bothersome in the early weeks of summer. They breed in fast-flowing watercourses so the best method of fighting them is by larviciding over a large area. This kind of project is best managed by a community or provincial government agency. Fogging or pesticidal spraying over a large area will have temporary benefits but the practice does not justify the hazard of contamination of nearby water bodies. Complete eradication of biting fly populations can never be realized, and real control is not possible because of the limitation of funds and a lack of sufficient trained personnel. Individual land-owners may operate their own larviciding in small areas (swamps, standing water, and rain pools adjacent to cottages) but it should be remembered that permits are required where the program might affect adjacent streams or lakes. The permit must be obtained from the Pesticides Control Section, Ministry of the Environment, 12 Fairview Road, Box 937, Barrie, Ontario, L4N 4P3.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